UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND - REGION I
ONE CONGRESS STREET, SUITE 1100
BOSTON, MASSACHUSETTS 02114-2023

FACT SHEET

DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE TO WATERS OF THE UNITED STATES PURSUANT TO THE CLEAN WATER ACT (CWA)

NPDES PERMIT NUMBER: MA0004901

PUBLIC NOTICE START AND END DATES:

NAME AND MAILING ADDRESS OF APPLICANT:

Harvard University
46 Blackstone Street
Cambridge, MA 02139

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Blackstone Steam Plant
46 Blackstone Street
Cambridge, MA 02139

RECEIVING WATER(S): Charles River
(USGS Hydrologic Code #01090001 – Charles River Basin)

RECEIVING WATER CLASSIFICATION(S): Class B - Warm water fishery, Restrictions: CSO

SIC CODE: 4961

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I. Proposed Action, Type of Facility and Discharge Location

The Blackstone Steam Plant, or "Facility", is owned and operated by Harvard University, or "Harvard", the permittee. This Facility is primarily operated to provide heating for Harvard's campus buildings. In addition, the Facility supplies process steam to on-campus academic and research laboratories and to the nearby Genzyme Corporation. The current permit, which was issued in 1980, authorized the discharge of up to 28.8 MGD of non-contact cooling water (NCCW) to the Charles River through Outfall 001. This flow reflected the full use of this facility as a steam-electric generating facility. The reissued permit will authorize the discharge of NCCW at up to 0.3 MGD through Outfall 001 as well as the discharge of a new Reverse Osmosis Reject (ROR) water discharge to proposed Outfall 002, also to the Charles River. See Figure 1 for a map of the facility and the outfalls.

Since 2001, due to a failure of the Facility's steam turbine, the Facility has been unable to produce electricity for transmission. Since then, the Facility has been used only to produce steam for portions of Harvard's campus and for local industrial users. Harvard bought this steam-electric generating plant and its associated buildings from the NStar Corporation ("NStar") in 2003.

To improve the overall efficiency of steam plant operations, Harvard initiated a boiler replacement project. The project involves replacement of the existing 75-year-old boiler with a new, more efficient boiler unit and installation of a 5 megawatt (MW) steam turbine/generator set. This new steam turbine will not employ a once through cooling system as the plant previously did, but will instead use a non-condensing back pressure system with exhaust steam directly supplying Harvard's central heating supply. Up to five (5) MW of electrical power will be generated as a result of the operation of this system. The project is designed to enhance the overall energy efficiency of steam plant operations by shifting load from the Facility's older boilers to the new boiler and through generation of up to 5 MW of electricity as a byproduct of steam production. As part of this project, Harvard is proposing to upgrade the existing steam plant demineralization system. The existing demineralization system, which employs ion exchange, will be supplemented through the addition of two (2) reverse osmosis (RO) units. This upgrade requires installation and operation of a new outfall to the Charles River, Outfall 002, for the discharge of RO reject (ROR) water which will be generated by these RO units. Harvard plans to upgrade the demineralization treatment train and install and operate the new RO system in 2007.

In addition to the boiler replacement project, Harvard is also proposing to replace the plant's existing auxiliary closed loop system with a new closed loop cooling system. The existing once-through cooling loop uses up to 0.3 million gallons per day (MGD) of water for cooling pumps, fan bearings, and associated equipment at the Facility. To maintain essential steam plant operations during the construction period, the new closed loop cooling system will be installed after the new boiler is fully tested and operational. Harvard currently projects that the existing once-through cooling system will be required

to support existing district heating requirements through December 2008. Following the installation and testing of the proposed boiler, Harvard proposes to install a closed loop cooling system with a "finfan" cooler to dissipate heat that will eliminate the need to operate the existing once-through non-contact cooling loop. Once the new closed loop cooling system is installed, the existing cooling water intake structure (CWIS) will no longer serve as an intake of river water. At this point, the discharge to Outfall 001 will be terminated. Table 1 below summarizes the current permit status and projected service dates for existing and proposed infrastructure:

Table 1

Structure	Process	Projected Service Dates
Existing Outfall 001	Non-contact cooling water	Current through December 2008
Existing Intake	Non-contact cooling water	Current through December 2008
New Outfall 002	RO reject water	Fall/Early Winter 2007

II. Description of Treatment System and Discharges

Outfall 001 – Non-Contact Cooling Water

Non-contact cooling water (NCCW) that is used to cool pumps, fan bearings, and associated equipment at the Facility is discharged to the Charles River through Outfall 001. Outfall 001 is located approximately 150 feet downstream of the Facility's CWIS. The outfall consists of a submerged 4-foot diameter discharge pipe, which runs parallel to the granite sidewall of the river approximately 10 feet offshore. The top of the outfall pipe is roughly 7 feet below the normal water surface elevation at the discharge point. The outlet is oriented in a downstream direction in approximately 12 feet of water.

Since June 2003, the maximum daily discharge volume from Outfall 001 has totaled 288,000 gallons with a corresponding discharge temperature ranging from approximately 40^{o}F to 83^{o}F. As shown in Figure 2, the maximum monthly discharge temperature has varied on a seasonal basis with variations in ambient river water temperature. During the summer, discharge temperature has ranged between 2^{o}F and 5^{o}F above ambient. During the winter, discharge temperature has typically ranged between 7^{o}F and 12^{o}F above ambient. These temperature increases are also referred to as the "delta T".

Figure 2 also illustrates the maximum allowable discharge temperature under the current NPDES discharge permit, 105°F, and the maximum allowable temperature for the Charles River, a warm water fishery, of 83°F. As shown, the discharge from Outfall 001 has remained in compliance with the maximum allowable discharge temperature of the current permit and the maximum allowable temperature criteria for a Class B warm water fishery.

To ensure compliance with Massachusetts ambient water quality criteria, the permittee evaluated the proposed maximum discharge temperature of 88°F using the Cornell Mixing Zone Expert System (CORMIX), a modeling program. Based on screening level simulations using CORMIX Version 4.03b, the existing single port discharge configuration achieves a minimum dilution factor of 3 at the end of the near-field mixing zone. The near-field mixing zone extends from the point of discharge through an area immediately downstream of the outfall in which mixing is dominated by the positive buoyancy of the discharge. This zone, situated in the immediate vicinity of the discharge port, occurs within a 10-meter radius of the outfall in which the less dense heated effluent rises through the water column to the surface of the river. As the discharge plume moves away from the near-field mixing zone, additional dilution and mixing will occur. Key CORMIX modeling input assumptions are listed in Table 2 below.

Table 2

CORMIX Modeling Input for Outfall 001		
Parameter	**Value**	**Units**
Average River Depth	12	Feet
Average River Width	325	Feet
River Flow	17.2	cfs (estimated 7Q10 flow)
Outfall Diameter	4.0	Feet
Discharge Flow Rate	0.3	Mgd
Height Above Bottom	2.5	Feet
Ambient River Temperature	80	°F
Discharge Temperature	88	°F

cfs = cubic feet per second
7Q10 = Seven-day, consecutive low flow with a ten year return frequency; the lowest stream flow for seven consecutive days that would be expected to occur once in ten years. Value based on United States Geological Survey (USGS) gaging station at Waltham, Massachusetts over the period of 1960-2006 and computed using EPA's DFLOW3 program.

EPA agrees with the application of the model and finds that it represents a mixing zone for temperature as provided in 40 CMR 4.03(2) of the MA SWQS. The model shows that in order to assure that the instream temperature standard of 83 °F is met at the boundary of the mixing zone, the permit must establish a maximum effluent temperature limit of 88 °F for Outfall 001, which has been done. Also refer to the discussion of temperature in Section IV of this Fact Sheet.

Outfall 002 – Reverse Osmosis Reject Water

The proposed new boiler and backpressure turbine requires an upgrade to the Facility's existing demineralization system. The current ion exchange system will be supplemented through the installation of 2 RO units to meet the high purity demineralized water requirements of the new boiler/non-condensing steam turbine. A schematic diagram of the modified demineralization system is attached as Figure 3 which shows that boiler makeup water will continue to be obtained from the City of Cambridge municipal distribution system. The new demineralization treatment train will consist of the following components/processes:

- Multi-media filtration, to remove any suspended solids contained in the raw water makeup supply;
- Water softening (existing ion exchange units), to remove dissolved salts and minerals contained in the raw water supply;
- Dechlorination (sodium bisulfite addition), to remove chlorine from the raw water makeup supply; and
- RO, to provide high purity demineralized water for boiler makeup.

The above treatment train will generate three waste streams:

- Multi-media backwash water;
- Ion exchange regenerant wastewater; and
- RO reject water.

Management of these waste streams is described below.

Multi-Media Backwash Water

Periodic backwashing of the multi-media filters will be required to remove accumulated solids and to prevent filter clogging. When required, the filters will be back flushed for approximately 20 minutes at a flow rate of approximately 350 gallons per minute (gpm). Backwash water will contain elevated levels of suspended solids. This intermittent waste stream will be directed to the City of Cambridge sewer system for subsequent treatment at the Massachusetts Water Resources Authority's (MWRA) Deer Island Wastewater Treatment Facility. Discharge of this backwash water is permitted under Harvard University's existing industrial user permit. This permit does not authorize the discharge of this water to the Charles River.

Regenerant Wastewater

The existing water softeners and neutralization system will continue to be used following boiler replacement. Water softening, using ion exchange, requires periodic regeneration of cation exchange resins. Resin regeneration is accomplished using sodium chloride.

Under current operations, the regenerant waste stream from the cation and anion exchange beds is treated using an in-line pH adjustment system. Following pH adjustment, the neutralized regenerant waste stream is discharged to the City of Cambridge sewer system. No changes are being proposed for management of this waste stream. Discharge of this wastewater is permitted under Harvard University's existing industrial user permit with the MWRA and will not be authorized by this permit.

Reverse Osmosis Reject Water

Under the proposed plan, neutralized reject water from the new RO units, estimated to total 0.15 MGD under maximum flow conditions, will be directed to the Charles River through a new outfall, Outfall 002, which is currently functioning as the facility's CWIS. This new outfall pipe will be installed through the existing intake tunnel and equipped with a single port, high velocity discharge nozzle. The high velocity discharge nozzle will provide for rapid initial dilution of the discharge to promote strong near-field mixing of the effluent under all river flow conditions. Effluent quality was estimated from the City of Cambridge municipal water supply following water softening treatment at the Facility and assuming a concentration factor of 4.

The permittee has provided Table 3 below which presents a breakdown of the projected discharge concentrations for the RO reject water. The three "Softener" columns represent 3 sampling events for water that exited one of the 3 currently operating water softener units. This water will enter one of the two RO units when they are installed.

Table 3

Parameter	Softener 3 2/6/2004	Softener 1 6/1/2004	Softener 1 11/9/2005	Max	Avg	Projected Maximum Discharge	Projected Average Discharge
BOD	NA	NA	NA	-	-	<10 mg/l	<10 mg/l
COD	NA	NA	NA	-	-	<10	<10
TOC	NA	NA	NA	-	-	<10	<10
TSS	NA	NA	NA	-	-	<10	<10
Ammonia	NA	NA	NA	-	-	<1	<1
Nitrate – Nitrite	2.69	2.26	1.498	2.69	2.15	10.8	8.6
Ortho Phosphate	0.010	0.010	0.030	0.03	0.017	0.12	0.07
Calcium	0.485	0.780	0.524	0.78	0.596	3.12	2.39
Magnesium	0.100	0.072	0.102	0.10	0.091	0.41	0.37
Manganese	0.004	0.000	0.007	.007	0.004	0.03	0.01
Sodium	98.2	98.2	119.9	120	105.4	479.6	421.7
Silica	7.950	5.030	5.100	7.95	6.027	31.80	24.11
Chloride	176.5	159.7	161.9	176	166.0	706.0	664.1
Sulfate	27.80	24.22	26.02	27.8	26.01	111.20	104.05

Iron	0.016	0.012	0.020	0.02	0.016	0.08	0.06
Copper	0.000	0.000	0.006	.006	0.002	0.02	0.01
Zinc	0.002	0.000	0.007	.007	0.003	0.03	0.01
Aluminum	0.045	0.000	0.019	.045	0.021	0.18	0.09
Bromide	0.130	0.520	0.000	0.52	0.217	2.08	0.87
Fluoride	NA	NA	NA	-	-	4.0	4.0
Temp. (Winter)	NA	NA	NA	-	-	60 ^{o}F	50 ^{o}F
Temp. (Summer)	NA	NA	NA	-	-	80 ^{o}F	65 ^{o}F

BOD = biochemical oxygen demand TOC = total organic carbon mg/l = milligrams per liter
COD = chemical oxygen demand TSS = total suspended solids NA = not applicable

Screening level simulations conducted by the permittee using CORMIX Version 4.03b indicate that the proposed single port discharge configuration will achieve a minimum dilution factor exceeding 20:1 at the end of the near-field mixing zone. The near-field mixing zone for Outfall 002 will extend from the point of discharge approximately 5 meters across the river. As the discharge plume moves away from the near-field mixing zone, additional dilution and mixing will occur. Following complete mixing, the discharge is subject to an estimated dilution factor of 75. Key CORMIX modeling input assumptions for Outfall 002 are listed in Table 4 below.

Table 4

CORMIX Modeling Input for Outfall 002		
Parameter	**Value**	**Units**
Average River Depth	12	Feet
Average River Width	325	Feet
River Flow	17.2	cfs (estimated 7Q10 flow)
Outfall Diameter	2.5	Inches
Discharge Flow Rate	0.15	MGD
Height Above Bottom	~10	Feet
Ambient TDS	250	mg/l
Discharge TDS	1,200	mg/l

TDS = total dissolved solids

The TDS concentration of the discharge is expected to be approximately 1,200 mg/l. By comparison, the TDS concentration of the river typically ranges between 200 and 300 mg/l. As such, the discharge will be negatively buoyant and tend to sink in the water column. Because of this, the discharge port will be set at an elevation approximately 2 feet below the mean water elevation of the river.

EPA agrees with the application of the model and finds that it represents a mixing zone for TDS as provided in 40 CMR 4.03(2) of the MA SWQS. EPA expects that the total

suspended solids (TSS) values will be subject to a similar mixing dynamic. Therefore, this permit has established a monthly average TSS limitation of 30 mg/l and a daily maximum effluent limitation of 45 mg/l for Outfall 002, based on the limits established in the ROGP. In addition, the dilution available in this mixing zone did not necessitate a total copper limit at this time, but monitoring is required. The basis for these conditions is discussed in Section IV of this Fact Sheet.

III. Receiving Water Description

Under the state water use classification system, MassDEP has designated this segment of the Charles River, which runs from the Watertown Dam to the Science Museum in Boston (Segment MA72-08), as a Class B water (314 CMR 4.00). Class B waters are designated as a habitat for fish, other aquatic life, and wildlife and for primary and secondary contact recreation. These waters are to be suitable for public water supply following appropriate treatment, irrigation and other agricultural uses, and compatible industrial cooling and process uses. The waters shall have consistently good aesthetic value. This segment of the Charles River does not always meet the state water quality standards prescribed for Class B waters, especially after wet weather. This segment is on the MassDEP's 2004 303(d) list of impaired waters for unknown toxicity, priority organics, metals, nutrients, organic enrichment/low dissolved oxygen, pathogens, oil and grease, taste, odor and color, noxious aquatic plants and turbidity.

For this permit, EPA has investigated whether this segment of the Charles River is impaired for copper based on a comparison of instream levels of copper and ambient water quality criteria for copper. Data from the Clean Charles 2005 Initiative collected by EPA between 1999 and 2004 shows that water column levels of dissolved copper in the vicinity of the discharge are below ambient acute and chronic water quality criteria in 69 of the 72 samples taken upstream and downstream of the facility in dry and wet weather. This sampling data may be found at http://www.epa.gov/region1/charles/2005.html, within the Clean Charles 2005 Water Quality Reports. Based on this lack of evidence that the facility's discharge is causing or contributing to an instream water quality impairment, EPA has applied a dilution factor to this discharge for copper, as shown in Section VI below.

IV. Limitations and Conditions

The effluent limitations and all other requirements described in Part VI of this Fact Sheet may be found in the draft permit.

V. Permit Basis: Statutory and Regulatory Authority

General Requirements

The Clean Water Act (CWA) prohibits the discharge of pollutants to waters of the United States without a National Pollutant Discharge Elimination System (NPDES) permit

unless such a discharge is otherwise authorized by the CWA. The NPDES permit is the mechanism used to implement technology and water quality-based effluent limitations and other requirements including monitoring and reporting. This draft NPDES permit was developed in accordance with various statutory and regulatory requirements established pursuant to the CWA and any applicable State regulations. The regulations governing the EPA NPDES permit program are generally found at 40 CFR Parts 122, 124, 125, and 136.

When developing permit limits, EPA must consider the most recent technology-based treatment and water quality-based requirements. Subpart A of 40 CFR Part 125 establishes criteria and standards for the imposition of technology-based treatment requirements in permits under Section 301(b) of the CWA, including the application of EPA-promulgated effluent limitations and case-by-case determinations of effluent limitations under Section 402(a)(1) of the CWA. EPA is required to consider technology and water quality-based requirements as well as all limitations and requirements in the existing permit when developing permit limits.

Technology-Based Requirements

Technology-based treatment requirements represent the minimum level of control that must be imposed under Sections 301(b) and 402 of the CWA (see 40 CFR §125 Subpart A) to meet best practicable control technology currently available (BPT) for conventional pollutants and some metals, best conventional control technology (BCT) for conventional pollutants, and best available technology economically achievable (BAT) for toxic and non-conventional pollutants. The only effluent limitations guidelines which are applicable to this facility are those for the Steam Electric Power Generating Point Source Category are found at 40 CFR Part 423. These guidelines do not include effluent limits on the discharge of heat from steam electric power generating point sources.

In general, the statutory deadline for non-POTW, technology-based effluent limitations must be complied with as expeditiously as practicable but in no case later than three years after the date such limitations are established and in no case later than March 31, 1989 (see 40 CFR §125.3(a)(2)). Compliance schedules and deadlines not in accordance with the statutory provisions of the CWA can not be authorized by a NPDES permit.

In the absence of published technology-based effluent guidelines, the permit writer is authorized under Section 402(a)(1)(B) of the CWA to establish effluent limitations on a case-by-case basis using best professional judgement (BPJ).

The effluent monitoring requirements have been established to yield data representative of the discharges under the authority of Section 308(a) of the Clean Water Act, according to regulations set forth at 40 CFR § 122.41(j), 122.44(i) and 122.48. The monitoring program in the permit specifies routine sampling and analysis which will provide continuous information on the reliability and effectiveness of the installed pollution abatement equipment. The approved analytical procedures are to be found in 40 CFR 136 unless other procedures are explicitly required in the permit.

Water Quality-Based Requirements

Water quality-based limitations are required in NPDES permits when EPA and the State determine that effluent limits more stringent than technology-based limits are necessary to maintain or achieve state or federal water quality standards (WQS). See Section 301(b)(1)(C) of the CWA.

Receiving water requirements are established according to numerical and narrative standards adopted under state law for each water quality classification. When using chemical-specific numeric criteria to develop permit limits, both the acute and chronic aquatic-life criteria, expressed in terms of maximum allowable in-stream pollutant concentration, are used. Acute aquatic-life criteria are considered applicable to daily time periods (maximum daily limit) and chronic aquatic-life criteria are considered applicable to monthly time periods (average monthly limit). Chemical-specific limits are allowed under 40 CFR § 122.44(d)(1) and are implemented under 40 CFR § 122.45(d). The Region has established, pursuant to 40 CFR 122.45(d)(2), a maximum daily limit and average monthly discharge limits for specific chemical pollutants.

A facility's design flow is used when deriving constituent limits for daily and monthly time periods as well as weekly periods where appropriate. Also, the dilution provided by the receiving water is factored into this process where appropriate. Narrative criteria from the state's water quality standards are often used to limit toxicity in discharges where (a) a specific pollutant can be identified as causing or contributing to the toxicity but the state has no numeric standard; or (b) toxicity cannot be traced to a specific pollutant.

EPA regulations require NPDES permits to contain effluent limits more stringent than technology-based limits where more stringent limits are necessary to maintain or achieve state or federal WQS. The permit must address any pollutant or pollutant parameter (conventional, non-conventional, toxic and whole effluent toxicity) that is or may be discharged at a level that causes or has "reasonable potential" to cause or contribute to an excursion above any water quality criterion. See 40 CFR Section 122.44(d)(1). An excursion occurs if the projected or actual in-stream concentration exceeds the applicable criterion. In determining reasonable potential, EPA considers (a) existing controls on point and non-point sources of pollution; (b) pollutant concentration and variability in the effluent and receiving water as determined from the permit application, Monthly Discharge Monitoring Reports (DMRs), and State and Federal Water Quality Reports; (c) sensitivity of the species to toxicity testing; (d) known water quality impacts of processes on wastewater; and, where appropriate, (e) dilution of the effluent in the receiving water.

WQS consist of three parts: (a) beneficial designated uses for a water body or a segment of a water body; (b) numeric and/or narrative water quality criteria sufficient to protect the assigned designated use(s); and (c) antidegradation requirements to ensure that once a use is attained it will not be degraded. The Massachusetts Surface Water Quality

Standards (MA SWQS), found at 314 CMR 4.00, include these elements. The state will limit or prohibit discharges of pollutants to surface waters to assure that surface water quality standards of the receiving waters are protected and maintained or attained. These standards also include requirements for the regulation and control of toxic constituents and require that EPA criteria, established pursuant to Section 304(a) of the CWA, shall be used unless a site-specific criterion is established. The conditions of the permit reflect the goal of the CWA and EPA to achieve and then to maintain WQS.

Consistent with the MA SWQS promulgated at 314 CMR 4.03(2) and MassDEP guidance documents, MassDEP may decide to exercise its discretion to set water quality based thermal discharge limits based on a "mixing zone". Generally, mixing zones are areas in which exceedances of numeric WQS may be allowed, provided that, among other things, these exceedances do not result in acute toxicity and that the mixing zone will still be protective of the narrative requirements of the WQS. In addition, mixing zones cannot be disproportionately large so as to interfere with the attainment of the designated uses assigned to the water body segment. All applicable numeric water quality criteria must be met at the edge of the mixing zone and requirements of the state mixing zone must also be satisfied.

Antibacksliding

A permit may not be renewed, reissued or modified with less stringent limitations or conditions than those contained in the previous permit unless in compliance with the anti-backsliding requirements of the CWA [see Sections 402(o) and 303(d)(4) of the CWA and 40 CFR §122.44(l)(1 and 2)]. EPA's antibacksliding provisions prohibit the relaxation of permit limits, standards, and conditions except under certain circumstances. Effluent limits based on BPJ, water quality, and state certification requirements must also meet the antibacksliding provisions found at Section 402(o) and 303(d)(4) of the CWA.

Antidegradation

Federal regulations found at 40 CFR Section 131.12 require states to develop and adopt a statewide antidegradation policy which maintains and protects existing instream water uses and the level of water quality necessary to protect the existing uses, and maintains the quality of waters which exceed levels necessary to support propagation of fish, shellfish, and wildlife and to support recreation in and on the water. The Massachusetts Antidegradation Regulations are found at Title 314 CMR 4.04. This draft permit is being reissued with a new discharge composed of reverse osmosis (ROR) reject water. This draft permit includes an antidegradation evaluation of this new discharge conducted by the MassDEP. This evaluation has found that there is no significant degradation as a result of this new discharge and that all existing uses of the receiving water shall be protected. The public is invited to participate in the anti-degradation finding through the permit public notice process

Section 316 of the Clean Water Act

With any NPDES permit issuance or reissuance, EPA is required to evaluate or re-evaluate compliance with applicable standards, including the standards in Section 316(a) of the CWA regarding thermal discharges, and Section 316(b) of the CWA regarding cooling water intake structures (CWIS). CWA Section 316(a) allows for variance-based effluent limitations for thermal discharges if certain conditions are met. If the applicant demonstrates to the satisfaction of EPA (or, if appropriate, the state) that the alternative effluent limitations proposed will assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the receiving water body, then the permitting authority may issue the permit with such alternative limitations. CWA Section 316(b) governs CWIS requirements and applies where a permit applicant seeks to withdraw cooling water from the waters of the United States. To satisfy Section 316(b), the location, design, construction, and capacity of the facility's CWIS must reflect the Best Technology Available (BTA) for minimizing adverse environmental impacts.

Both Section 316(a) and Section 316(b) of the CWA apply to this permit. Section 316(a) applies because of the discharge of NCCW water potentially above the warm water fishery standard of 83 ^{o}F and Section 316(b) applies because the Facility operates a CWIS.

CWA 316(a)

In developing effluent limitations, EPA is to determine technology-based and water quality-based requirements, and whichever is more stringent would govern the permit requirements. For thermal discharges, however, EPA may also consider granting a variance under Section 316(a) (as codified at 40 CFR Part 125, Subpart H) from either or both the technology-based and water quality-based effluent limitations if the permittee can demonstrate that less stringent variance-based limitations will nevertheless be sufficient to "assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife" (BIP) in and on the water body receiving the discharge. This demonstration must show that the alternative effluent limitations desired by the permittee, considering the cumulative impact of its thermal discharge together with all other significant impacts on the species affected, will assure the protection and propagation of the BIP.

As a practical matter, EPA has with some permits simply developed permit limitations under a Section 316(a) variance if a set of limitations were determined to be sufficient to assure protection and propagation of the BIP. In such cases, determining the technology-based and water quality-based limitations would have served no practical purpose. Similarly, in some cases, EPA has determined water quality-based conditions without determining the technology-based requirements, when we had reason to believe that it was clear that the water quality-based requirements would be more stringent than the technology-based standards.

Based on the permittee's modeling results described earlier, it appears that there is sufficient dilution within the mixing zone for the NCCW discharge at Outfall 001 which is expected to result in compliance with the 83 ^{o}F standard. Therefore, a 316(a) variance from water quality-based standards is not required for this discharge. Similarly, EPA does not believe it necessary to establish technology-based limits, as we believe that the limits established for this outfall will assure the protection and propagation of the BIP in compliance with CWA 316(a).

CWA 316(b)

Section 316(b) of the CWA requires NPDES permits to ensure that the location, design, construction, and capacity of CWIS reflect the best technology available (BTA) to minimize adverse environmental impact. Such impacts include death or injury to aquatic organisms by impingement (being pinned against screens or other parts of a cooling water intake structure) or entrainment (being drawn into cooling water systems and subjected to thermal, physical or chemical stresses).

Under its previous operation as a steam electric generating plant, the Facility withdrew up to 28.8 MGD of cooling water from the Charles River. The existing intake opening is located along the granite block sidewall of the Charles River directly in front of the Facility. The intake opening is approximately 8 feet wide and 12 feet deep and designed to withdraw water from the surface of the river. The opening is equipped with bar racks to screen out large debris from entering the 4 foot diameter intake tunnel. The intake tunnel extends beneath Memorial Drive approximately 90 feet in an easterly direction to the intake well, which is located adjacent to the northeastern corner of the Facility. Water withdrawn from the intake well passes through a duplex filter prior to use as NCCW. The updated EPA Form 2C application requests authorization to withdraw and discharge 0.3 MGD of NCCW, representing a 98% reduction from the current permitted withdrawal volume. Based on the updated withdrawal capacity of 0.3 MGD, the permittee has estimated that the intake opening has an approach velocity of approximately 0.005 feet per second (fps). Based on the permittee's estimate that the bar racks reduce the open area of intake by 30 percent, the through-bar velocity of the CWIS is estimated to be 0.007 fps.

In the case of this permit, EPA is making a 316(b) determination for this facility on a BPJ basis. EPA has considered the existing CWIS, changes proposed by the boiler replacement project, and potential adverse environmental impacts and determined that the location, design, construction, and capacity of the existing CWIS, as permitted in this draft permit, represent BTA.

Regarding the capacity of the CWIS, a primary consideration in the determination is the present reduction in CWIS capacity from 28.8 MGD to 0.3 MGD. This represents a 98% reduction. A significant reduction in the impingement mortality and entrainment of aquatic organisms is expected with this capacity reduction. A further consideration is the future elimination of the CWIS capacity due to the CWIS being eliminated by December 31, 2008. This will eliminate adverse environmental impacts due to the CWIS.

Regarding the design of the CWIS, prior to the elimination of the CWIS by December 31, 2008, impingement mortality due to the low intake velocity associated with the present CWIS design will be minimal.

In conclusion, based on the significantly reduced water withdrawal of 0.3 MGD, the estimated low through-bar velocity of the existing intake opening of 0.007 fps, and the proposed installation of a closed loop cooling system by December 31, 2008 which will terminate the intake of water through this CWIS, the EPA is making a BPJ determination that location, design, construction and capacity of the existing CWIS represents BTA for this facility. In Part I.C.2, the draft permit requires that any change to the location, design, or capacity of the CWIS be approved by the Regional Administrator and the Director.

State Certification

Under Section 401 of the CWA, EPA is required to obtain certification from the state in which the discharge is located that all water quality standards or other applicable requirements of state law, in accordance with Section 301(b)(1)(C) of the CWA, are satisfied. EPA permits are to include any conditions required in the state's certification as being necessary to ensure compliance with state water quality standards or other applicable requirements of state law. (See CWA Section 401(a) and 40 CFR §124.53(e).) Regulations governing state certification are set out at 40 CFR §124.53 and §124.55. EPA regulations pertaining to permit limits based upon water quality standards and state requirements are contained in 40 CFR §122.44(d).

VI. Explanation of Permit's Effluent Limitations

Outfall 001

The flow limit in this draft permit has been revised downward to reflect the fact that the previous steam turbine and condenser have been dismantled. The 1980 permit had a daily maximum flow limit of 28.8 MGD, reflecting the full generating capacity of the previously configured steam-electric plant. This permit has established a daily maximum flow limit of 0.3 MGD with a reporting requirement for the monthly average flow. This flow value is an estimate made by the permittee based on pump capacity curves for the flow sufficient to cool the existing equipment. The permittee is authorized to discharge this NCCW only through December 31, 2008, after which time there will be no discharge of any NCCW because the new steam turbine and generator will rely on a rooftop "finfan" type cooler to dissipate heat.

In order to assure that the 83 ^{o}F instream standard is achieved, the permittee's modeling discussed earlier showed that the effluent temperature can be no higher than 88 ^{o}F. As described earlier, EPA and MassDEP have agreed that the permittee's modeling for temperature for this outfall represents a mixing zone consistent with the MA SWQS at 314 CMR 4.03(2). Therefore, in order to assure that this temperature standard is met,

this permit has established monthly average and daily maximum effluent temperature limits of 88 ^{o}F.

The pH range is limited to the Class B range of 6.5 to 8.3 standard units which is the range required by state water quality standards (WQS) and which can be found at 314 CMR 4.05. There has also been a dissolved oxygen (DO) monitoring requirement established, due to the low DO impairment of the receiving water.

The periodic discharge of boiler blowdown from the previous boiler was allowed under the facility's permit with the MWRA. The permittee expects that the new boiler will also require the periodic discharge of boiler blowdown and expects that the MWRA will allow this discharge into its system. Therefore, the discharge of boiler blowdown has not been authorized by this NPDES permit.

Outfall 002

On December 17, 2002, the EPA issued a General Permit (GP) to authorize certain discharges of Reject water from RO units, the "ROGP". However, the EPA and MassDEP may consider the issuance of individual permits instead of GPs for reasons including when "the discharge(s) is into an impaired water of the Federal Clean Water Act 303(d) list, and the pollutant/stressor listed on the 303 (d) list is one of the parameters limited in the permit." As discussed earlier, this segment of the Charles River is on the 303(d) list for unspecified metals, and certain metals, including copper, are expected to be discharged in the RO reject water. In this case, EPA and MassDEP have determined that the individual permit is the appropriate option for this ROR discharge, since it is being proposed into an impaired water. Where appropriate, however, the limits and conditions associated with this RO reject water discharge are based on the conditions found in the ROGP. These situations are noted in the discussion below and a more detailed explanation of the rationale for these limits can be found in the ROGP.

The ROGP has 2 sets of limits, one for discharges with a dilution factor of 10 to 99 and another for a dilution factor of 100 to 1000. The permittee estimated a dilution factor of 75 for this discharge. Therefore, where appropriate, the ROGP limits associated with the 10 to 99 range were used to establish this permit's limits. The permittee expects a maximum RO reject water flow of 0.15 MGD and this has been established as a daily maximum limit with a report only requirement for the monthly average flow.

Since RO systems tend to concentrate the solids concentration of the intake water, consistent with the ROGP, this permit establishes permit limits of 30 mg/l and 45 mg/l for total suspended solids (TSS) as well as a monitoring requirement for the mass of TSS discharged. Similar to the ROGP, the TSS limits are based on BPJ and are sufficient to meet WQS and to satisfy BCT as described in Section 304(a) of the CWA.

Total copper limits in the ROGP are established at a monthly average of 52 ug/l and a daily maximum of 73 ug/l when the dilution factor is between 10 and 99. The permittee projects an average and maximum total copper discharge of 10 ug/l and 20 ug/l,

respectively, based on the CORMIX model discussed earlier. Copper may be toxic to aquatic life at low concentrations, so the ROGP contains numerical limits for total recoverable copper and specifies an appropriate method of analysis. The copper limits that would apply for this discharge have been calculated below to reflect the water quality criteria published in the Federal Register on December 10, 1998 and a dilution factor of 75.

Water Quality-Based Total Copper limits that would apply to this discharge

$$e\,(X\,[\ln(h)] + Y)$$

Where:	Chronic	Acute
X=	0.8545	0.9422
Y=	-1.702	- 1.70

ln = natural logarithm
Estimated hardness = 50 mg/l as CaCO3

Thus;

e(.8545 [(ln50)] -1.702) = 5.2 ug/l

e(.9422 [(ln50)] -1.70) = 7.3 ug/l

To achieve the effluent limit, the dilution factor of 75 is used:

Water Quality Based Effluent Limitations:

Monthly Average (chronic)	Daily Maximum (acute)
75 (5.2) = **390 ug/l**	75 (7.3) = **547 ug/l**

Based on the expected concentration of copper in the effluent, there is not a reasonable potential that this discharge will violate either one of these values. Therefore, a monitor only requirement has been established for total copper to verify that the actual effluent levels are consistent with those approximated by the model. Based on the expected concentrations of other parameters in this effluent shown on Table 3 and in consideration of the dilution available to this discharge, it was determined that no other parameter had a reasonable potential to cause or contribute to any water quality standards violations.

The pH range is limited to the Class B range of 6.5 to 8.3 standard units which is the range required by state WQS and which can be found at 314 CMR 4.05. Consistent with the Class B standard, there is also a minimum dissolved oxygen (DO) level of 5.0 mg/l required, to be monitored once per week.

Although the ROGP has a limit for Total Residual Chlorine (TRC), the permittee will not be using any chlorine based chemical for cleaning purposes and all discharges associated with the cleaning of the RO units will be discharged to the MWRA's system. In addition,

the permittee will be adding sodium bisulfite to the city water to remove any residual chlorine. Therefore, there has been no TRC requirement established in this permit.

When RO units are bleached or cleaned with hypochlorite or other chlorine based compounds, chloromines are created, which in turn results in the reject water containing ammonia. Therefore, Total Ammonia Nitrogen monitoring is required in the ROGP. Although the permittee will be discharging all of its RO cleaning waters to the MWRA system, it is not clear what compounds will be used in these RO cleaning operations. In any event, it is not known whether such cleaning may potentially increase the discharge levels of ammonia during normal RO operation. Additionally, the Charles River is impaired for nutrients. Therefore, a monthly Total Ammonia Nitrogen monitoring requirement has been established in this permit. The discharge of wastewaters to the Charles River from any and all cleaning or backwashing of these RO units has not been authorized by this permit.

Stormwater

As part of the ongoing site improvement, the permittee's goal was to eliminate the flow of site runoff to the local combined sewer system and to preclude storm water runoff from being diverted and unnecessarily consuming treatment capacity of the MWRA Deer Island wastewater facility. When complete, the site upgrade will result in all surface runoff being conveyed to a bioswale system that will rely on vegetated embankments and a semi-permeable soil system to remove contaminants from the runoff stream. Water that permeates through the soil will then be collected in a slotted drain line that underlies the bioswale and will discharge to the intake well for use as NCCW or be discharged to the Charles River.

All Facility site roof runoff will be conveyed to the intake well downstream of the bioswale. See Facility layout in Figure 4. Except for two buildings, all roofs consist of rubber membrane construction: the Blackstone Administration Building (Building 6) is covered with slate shingles; and on-site garage (Building 12) which has a rubber membrane covered by ½-inch crushed stone.

The site upgrade project also included installation of a new oil off-loading pad which is equipped with a 12,500-gallon sump to provide for full secondary containment for delivery tankers. Storm water entering the sump will be periodically collected and transported off-site for disposal. This measure has eliminated outdoor exposure of rainfall to potential contaminant sources. Under severe storm conditions, the bioswale is also equipped with an overflow to the intake well. This Facility's operations as a provider of steam (SIC code 4961) fall under those storm water discharges associated with industrial activity which would require permit coverage under EPA's multi-sector general permit (MSGP) for storm water. However, such discharges may be exempt from monitoring if the site owner submits a "no exposure" certification. The permittee has submitted such a "no exposure" certification to EPA with a form dated 12/1/06. Therefore, this facility does not require coverage under the MSGP since it does not discharge storm water associated with industrial activity.

VII. Essential Fish Habitat Determination (EFH)

Under the 1996 Amendments (PL 104-267) to the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 et seq. (1998)), EPA is required to consult with the National Marine Fisheries Services (NMFS) if EPA's action or proposed actions that it funds, permits, or undertakes, may adversely impact any essential fish habitat such as: waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 U.S.C. § 1802 (10)). Adversely impact means any impact which reduces the quality and/or quantity of EFH (50 C.F.R. § 600.910 (a)). Adverse effects may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species' fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

EFH is only designated for species for which federal fisheries management plans exist (16 U.S.C. § 1855(b) (1) (A)). EFH designations for New England were approved by the U.S. Department of Commerce on March 3, 1999. The following is a list of the EFH species and applicable lifestage(s) for the area that includes Massachusetts Bay, to which the Charles River discharges:

Species	Eggs	Larvae	Juveniles	Adults
Atlantic cod (*Gadus morhua*)	X	X	X	X
haddock (*Melanogrammus aeglefinus*)	X	X		
pollock (*Pollachius virens*)	X	X	X	X
whiting (*Merluccius bilinearis*)	X	X	X	X
Red hake (*Urophycis chuss*)	X	X	X	X
white hake (*Urophycis tenuis*)	X	X	X	X
winter flounder (*Pseudopleuronectes americanus*)	X	X	X	X
yellowtail flounder (*Pleuronectes ferruginea*)	X	X	X	X
windowpane flounder (*Scopthalmus aquosus*)	X	X	X	X
American plaice (*Hippoglossoides platessoides*)	X	X	X	X
ocean pout (*Macrozoarces americanus*)	X	X	X	X
Atlantic halibut (*Hippoglossus hippoglossus*)	X	X	X	X
Atlantic sea scallop (*Placopecten magellanicus*)	X	X	X	X
Atlantic sea herring (*Clupea harengus*)		X	X	X
long finned squid (*Loligo pealei*)	n/a	n/a	X	X

short finned squid (*Illex illecebrosus*)	n/a	n/a	X	X
Atlantic butterfish (*Peprilus triacanthus*)	X	X	X	X
Atlantic mackerel (*Scomber scombrus*)	X	X	X	X
summer flounder (*Paralicthys dentatus*)				X
scup (*Stenotomus chrysops*)	n/a	n/a	X	X
black sea bass (*Centropristus striata*)	n/a		X	X
surf clam (*Spisula solidissima*)	n/a	n/a	X	X
bluefin tuna (*Thunnus thynnus*)			X	X

A review of the 23 species in this table for the Mirant Kendall Station draft permit (MA0004868) in 2004 revealed that the life stages of concern were present in the seawater salinity zone (salinity > 25.0 parts per thousand) or the mixing water/brackish salinity zone (0.5 < salinity < 25.0 parts per thousand) only. No life stage was identified as inhabiting the tidal freshwater salinity zone. Although there is some seasonal salt water intrusion into the Lower Basin of the Charles River (that segment below the Boston University Bridge), the freshwater of the Charles River in the vicinity of this Facility's discharges does not experience appreciable mixing with the saline Boston Harbor water, due to the location of New Charles River Dam and Locks at the mouth of the river. This dam highly regulates the river level and flow of the Charles River, resulting in the river possessing the characteristics of the freshwater salinity zone.

Based on the available information, EPA has determined that Blackstone Station's operation, as restricted by the draft permit conditions, will not directly or indirectly cause adverse effects to EFH species or their habitat, because the draft permit contains limits that are protective of the aquatic species in the Charles River. Specifically, for the intake of cooling water, the through bar velocity is very low, the intake volume has been reduced considerably, and the intake of water for cooling purposes will terminate no later than December 31, 2008. For the RO reject water discharge, appropriate limits have been established and all cleaning wastewaters will be discharged to the MWRA's sewer system and not directly to the Chares River.

VIII. **Endangered Species Act (ESA)**

Section 7(a) of the Endangered Species Act of 1973, as amended (ESA) grants authority to and imposes requirements upon Federal agencies regarding endangered or threatened species of fish, wildlife, or plants ("listed species") and habitat of such species that has been designated as critical (a "critical habitat"). The ESA requires every Federal agency, in consultation with and with the assistance of the Secretary of Interior, to insure that any action it authorizes, funds, or carries out, in the United States or upon the high seas, is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. The United States Fish and

Wildlife Service (USFWS) typically administer Section 7 consultations for bird, terrestrial, and freshwater aquatic species. The NMFS typically administers Section 7 consultations for marine species and anadromous fish.

EPA has reviewed the federal endangered or threatened species of fish, wildlife, and plants to see if any such listed species might potentially be impacted by the reissuance of this NPDES permit and has not found any such listed species. NMFS has informed EPA that no species of concern are present in the vicinity of the outfalls from this Facility. Upon review of the current endangered and threatened species in the area, there appear to be no species of concern. Therefore, EPA does not need to formally consult with NMFS or USFWS in regard to the provisions of the ESA.

EPA has structured the proposed limits to be sufficiently stringent to assure that Water Quality Standards and 316(a) variance provisions will be met, both for aquatic life protection and human health protection. The effluent limits established in this permit ensure the protection of aquatic life and maintenance of the receiving water as an aquatic habitat. During the public comment period, EPA has provided a copy of the Draft Permit and Fact Sheet to both NMFS and USFWS.

Other Conditions

The remaining conditions of the permit are based on the NPDES regulations, 40 CFR Parts 122 though 125, and consist primarily of management requirements common to all permits.

IX. State Certification Requirements

EPA may not issue a permit unless the State Water Pollution Control Agency with jurisdiction over the receiving waters certifies that the effluent limitations contained in the permit are stringent enough to assure that the discharge will not cause the receiving water to violate State WQS. The staff of MassDEP has reviewed the draft permit and advised EPA that the limitations are adequate to protect water quality. EPA has requested permit certification by the State pursuant to 40 CFR 124.53 and expects that the draft permit will be certified.

X. Public Comment Period, Public Hearing, and Procedures for Final Decision

All persons, including applicants, who believe any condition of the draft permit is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period, to the U.S. EPA, Massachusetts Office of Ecosystem Protection (CIP), 1 Congress Street, Suite 1100, Boston, Massachusetts 02114-2023. Any person, prior to such date, may submit a request in writing for a public hearing to consider the draft permit to EPA and MassDEP. Such requests shall state the nature of the issues proposed to be raised in the hearing. A public hearing may be held after at least thirty days public notice whenever the Regional

Administrator finds that response to this notice indicates significant public interest. In reaching a final decision on the draft permit the Regional Administrator will respond to all significant comments and make these responses available to the public at EPA's Boston office.

Following the close of the comment period, and after a public hearing, if such hearing is held, the Regional Administrator will issue a final permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice. Within 30 days following the notice of the final permit decision, any interested person may submit a request for a formal hearing to reconsider or contest the final decision. Requests for formal hearings must satisfy the requirements of 40 CFR 124.74, 48 Fed. Reg. 14279-14280 (April 1, 1983).

XI. EPA and MassDEP Contacts

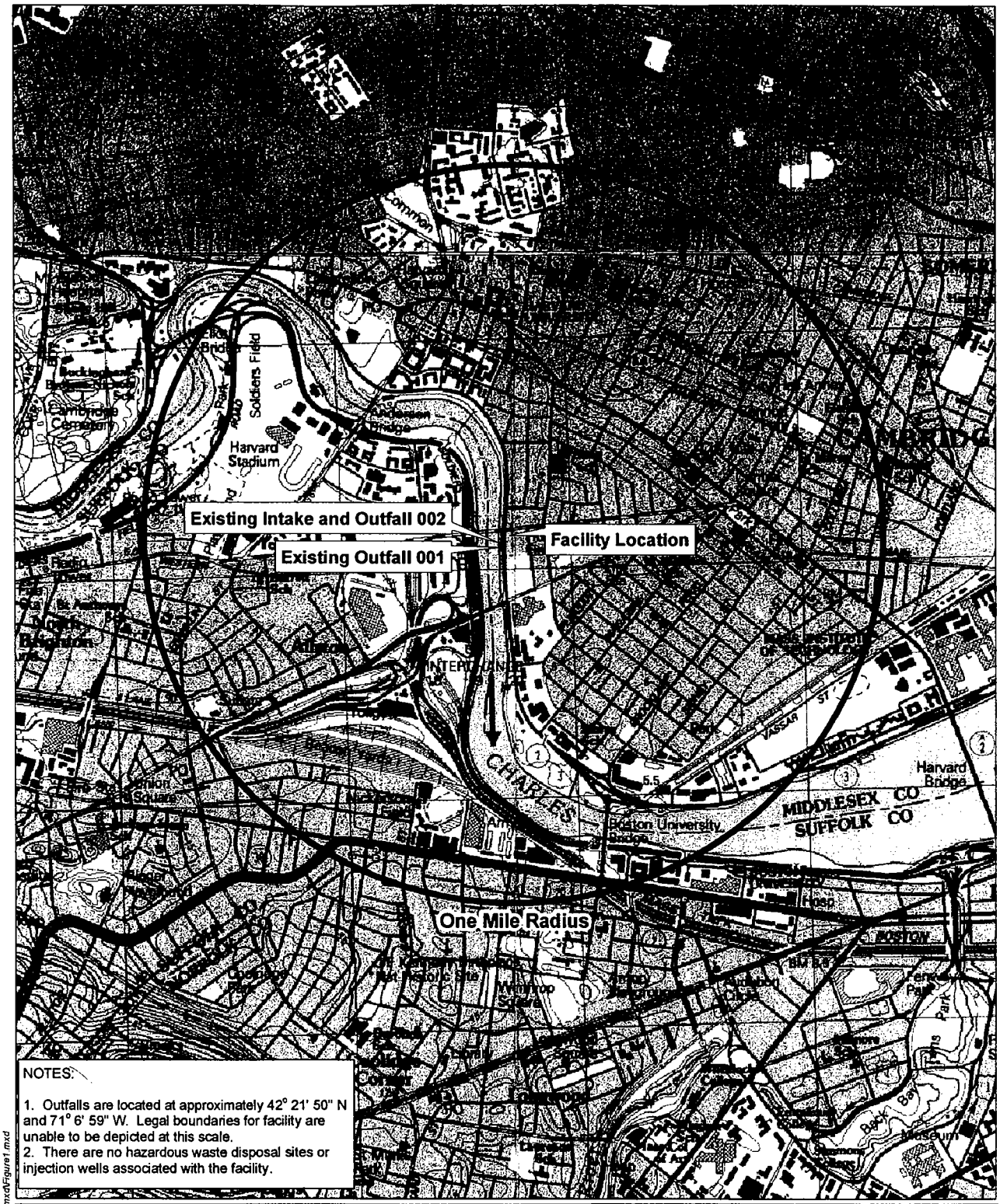
Additional information concerning the draft permit may be obtained between the hours of 9:00 a.m. and 5:00 p.m., Monday through Friday, excluding holidays, from the EPA and MassDEP contacts below:

George Papadopoulos, Massachusetts Office of Ecosystem Protection
One Congress Street Suite 1100 - Mailcode CIP
Boston, MA 02114-2023
Telephone: (617) 918-1579 FAX: (617) 918-1505

Paul Hogan, Massachusetts Department of Environmental Protection
Division of Watershed Management, Surface Water Discharge Permit Program
627 Main Street, 2nd Floor, Worcester, Massachusetts 01608
Telephone: (508) 767-2796 FAX: (508) 791-4131

February 20, 2007
Date

Stephen S. Perkins, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency



Base map is 'Newton and Boston South' 1:24,000-scale USGS topographic quadrangles.

DIRECTION OF CURRENT

0 1,000 2,000 Feet

N

MASSACHUSETTS

QUADRANGLE LOCATION

TRC

Boott Mills South
116 John Street
Lowell, MA 01852
978-970-5600

FIGURE 1
FACILITY LOCATION AND OUTFALLS
BLACKSTONE STEAM PLANT
CAMBRIDGE, MASSACHUSETTS

R:\Projects\GIS_2004\43081_Harv-Blackstone\mxd\Figure1.mxd

Figure 2
Maximum Monthly Effluent Temperature
Blackstone Steam Plant

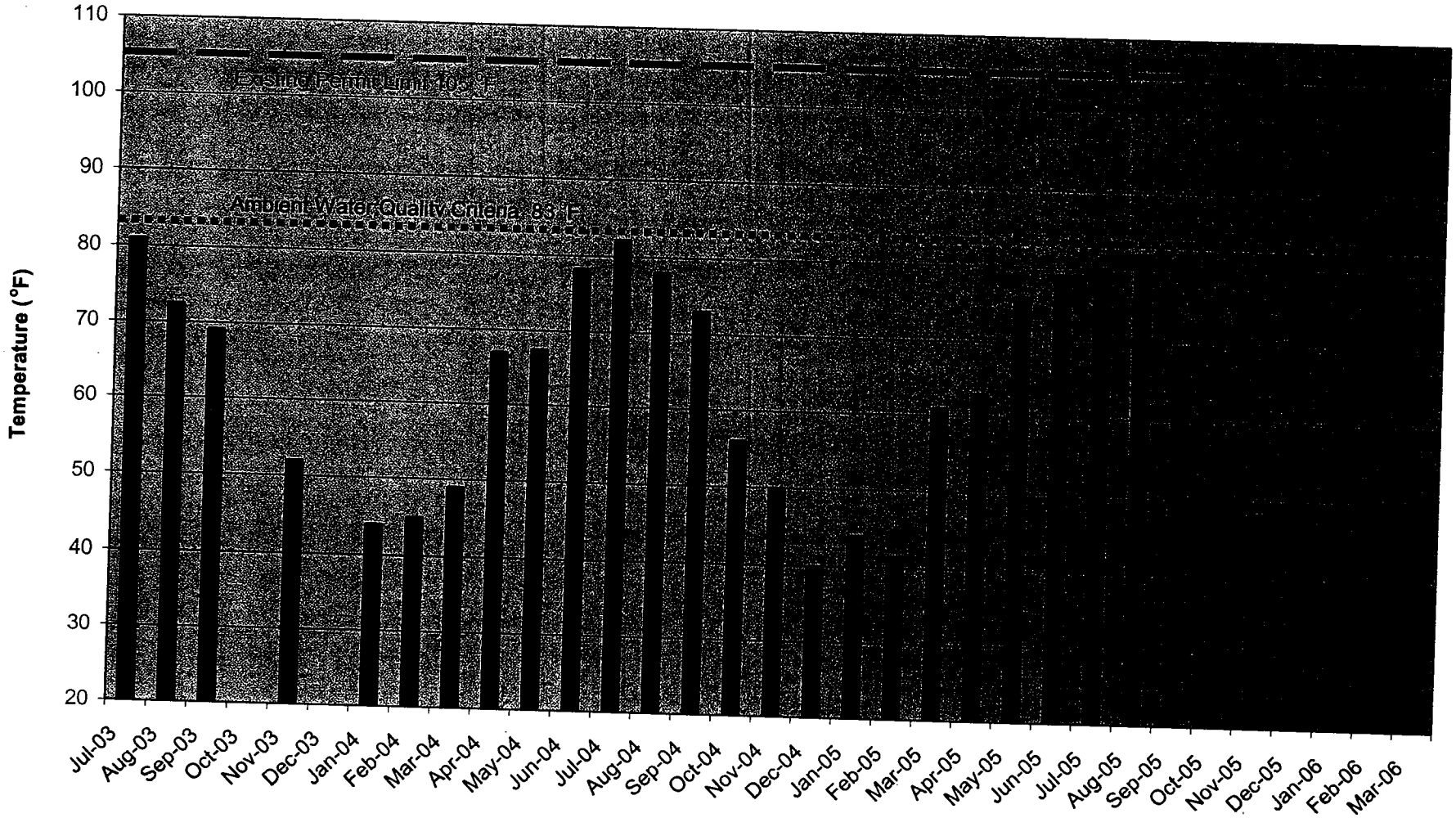
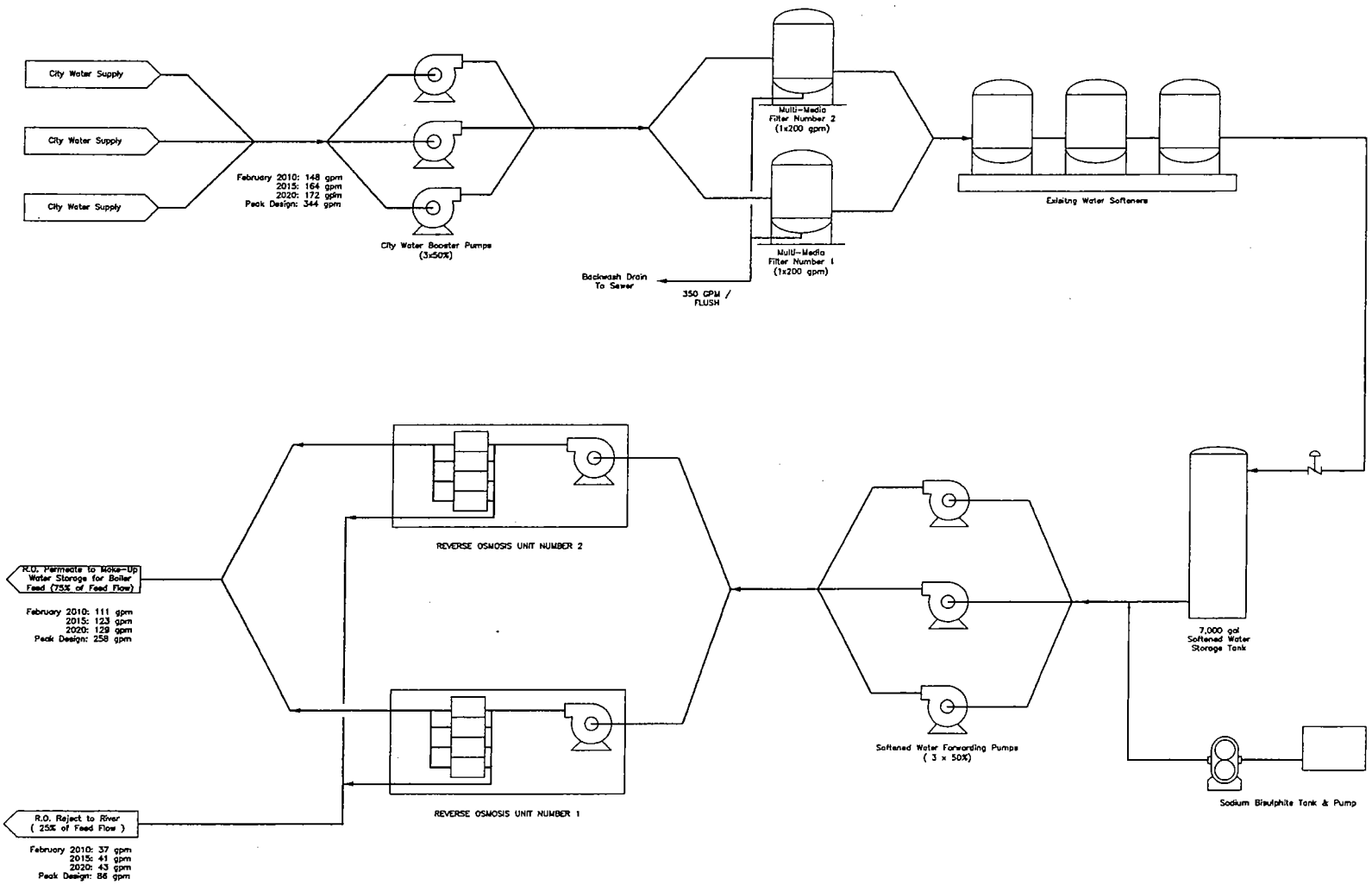


FIGURE 3 - WATER FLOW SCHEMATIC



NOTES

1. Flow totals for Feed, R.O. Permeate and R.O. Reject are based on February averages for each year shown. This is the month of greatest water consumption for the plant.

REV. No.	REV. BY	DATE	DESCRIPTION	CHECKED BY
A			FOR INFORMATION ONLY	

SEAL

SIGNATURE

DATE

	NAME	DATE
DRAWN BY	S. GREEN	6/9/05
CHECKED BY	M. LETOURNEAU	6/9/05
APPROVED BY	J. SWEET	6/9/05

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DRAWING TITLE

BLACKSTONE STEAM PLANT
UPGRADE PROJECT

WATER TREATMENT
PROCESS FLOW DIAGRAM

Attachment B

CLIENT DRAWING

WALDRON DRAWING

71.42-PFD-13

FIGURE 4 - SITE LAYOUT